

WHAT IS CLAIMED IS:

1. An isolated oligonucleotide selected from the group consisting of:
  - (i) an oligonucleotide having one of the following nucleotide sequences  
ACC AGC CCC TGA TAC CCT,  
AAG GTT CGC CCA CCG ACT,  
CCG ACA CTA CCC ACT CGT,  
TCT CAC CCT CAA GAT CGC,  
GCT GCA CCA CCA ATC TCT,  
AAG CCC CTC CCG ATT CCA,  
ACC TAC CTC CAG AGC ATT,  
CCC TCC CGA TTC CAT AAA,  
CAA ATA GGG GCA GGT TGC,  
ACC AGC CTC CAC TTC TCT,  
TAC CTT CCG CTT TAG GTC,  
TCG GSC GCT CCG TGA GCG,  
CCG TGA GCG CAA GGC CTT,  
ACG TTC CTC TGC GAG CCT,  
GGC ACG GAA CGA CGC GAA,  
CTC TCC TCA CCT CTA GTC,  
CCT CTC CTC GCC TCA A,  
TCA CGG ACT TCA GGC GTT,  
CTC AGT AGA TTC CCA CGT,  
GCG GTT AGC CTA GCT ACT,  
TGG TAA CCG GCC TCC TTG,  
TAA AGC GAG ACT GAC GGC,  
TGC CGC ACT CCA GCT ATA,  
GCC GCA CTC CAG CTA TAC,  
CTC TCC CGG ACT CGA GCC,  
TCT CGA CCT CAA GAA CAG,  
ACT TCC CTC TCC CAA ATT,  
GCG ACT TGC GCC TTT CCC,

GCT GCA CCA CCG ACC CCT,  
TGC CGC ACT CCA GCG ATG,  
ACT TCC CTC TCC CAC ATT,  
TCG CCT CTC TCA TCC TC,  
TCC GGT CTC CAG CCA CA,  
AAG TCC CCC GAC ATC CAG,  
ACC CGA CCG TGG ACG GCT,

(ii) an oligonucleotide being at least 80% identical to one of the oligonucleotides from (i), and rendering possible specific hybridization with nucleic acid sequences of filamentous bacterial cells,

(iii) an oligonucleotide differing from one of the oligonucleotides from (i) by a deletion and/or addition and rendering possible specific hybridization with nucleic acid sequences of filamentous bacterial cells, and

(iv) an oligonucleotide hybridizing under stringent conditions with one of the oligonucleotides from (i), (ii) or (iii).

2. A method for detecting filamentous bacteria in a sample, comprising the steps:

- a) fixing the filamentous bacteria contained in the sample;
- b) incubating the fixed bacteria with at least one oligonucleotide, selected from the group consisting of

(i) an oligonucleotide having one of the following nucleotide sequences

ACC AGC CCC TGA TAC CCT,  
AAG GTT CGC CCA CCG ACT,  
CCG ACA CTA CCC ACT CGT,  
TCT CAC CCT CAA GAT CGC,  
GCT GCA CCA CCA ATC TCT,  
AAG CCC CTC CCG ATT CCA,  
ACC TAC CTC CAG AGC ATT,  
CCC TCC CGA TTC CAT AAA,  
CAA ATA GGG GCA GGT TGC,  
TGG CCC ACC GGC TTC GGG,

ACC CTC CTC TCC CGG TCT,  
ACC AGC CTC CAC TTC TCT,  
TAC CTT CCG CTT TAG GTC,  
TCG GSC GCT CCG TGA GCG,  
CCG TGA GCG CAA GGC CTT,  
ACG TTC CTC TGC GAG CCT,  
GGC ACG GAA CGA CGC GAA,  
CTC TCC TCA CCT CTA GTC,  
CCT CTC CTC GCC TCA A,  
TCA CGG ACT TCA GGC GTT,  
CTC AGT AGA TTC CCA CGT,  
GCG GTT AGC CTA GCT ACT,  
TGG TAA CCG GCC TCC TTG,  
TAA AGC GAG ACT GAC GGC,  
TGC CGC ACT CCA GCT ATA,  
GCC GCA CTC CAG CTA TAC,  
CTC TCC CGG ACT CGA GCC,  
TCT CGA CCT CAA GAA CAG,  
ACT TCC CTC TCC CAA ATT,  
GCG ACT TGC GCC TTT CCC,  
GCT GCA CCA CCG ACC CCT,  
TGC CGC ACT CCA GCG ATG,  
ACT TCC CTC TCC CAC ATT,  
CCT TCC GAT CTC TAT GCA,  
CCT TCC GAT CTC TAC GCA,  
TGT GTT CGA GTT CCT TGC,  
GCA CCA CCG ACC CCT TAG,  
CTC AGG GAT TCC TGC CAT,  
TCG CCT CTC TCA TCC TC,  
TCC GGT CTC CAG CCA CA,  
AAG TCC CCC GAC ATC CAG,

ACC CGA CCG TGG ACG GCT,

(ii) an oligonucleotide being at least 80% identical to one of the oligonucleotides from (i), and rendering possible specific hybridization with nucleic acid sequences of filamentous bacterial cells,

(iii) an oligonucleotide differing from one of the oligonucleotides from (i) by a deletion and/or addition, and rendering possible specific hybridization with nucleic acid sequences of filamentous bacterial cells, and

(iv) an oligonucleotide hybridizing under stringent conditions with one of the oligonucleotides from (i), (ii) or (iii),

in order to achieve hybridization,

c) removing non-hybridized oligonucleotides; and

d) detecting and visualizing the filamentous bacterial cells with the hybridized oligonucleotides.

3. The method according to claim 2, wherein detection is performed by epifluorescence microscopy or flow cytometry.

4. The method according to claim 2, wherein the oligonucleotide is operatively linked to a detectable marker, selected from the group consisting of

- a) fluorescent marker;
- b) chemoluminescent marker;
- c) radioactive marker;
- d) enzymatically active groups;
- e) hapten; and
- f) nucleic acids detectable by hybridization.

5. The method according to claim 4, wherein detection is performed by epifluorescence microscopy or flow cytometry.

6. The method according to claim 2, wherein the sample is an activated sludge sample.

7. The method according to claim 6, wherein detection is performed by epifluorescence microscopy or flow cytometry.

8. The method according to claim 2, wherein the filamentous bacteria belong to bacteria of the following designations:

021N Kanagawa group I, 021N Kanagawa group II, 021N Kanagawa group III, 021N like from BIO33 EU21, *Alisphaera europaea* EU24 *Nostocoida limicola*-like, *Alisphaera (europaea, PPx3, MC2)*, *Alisphaera* MC2 MACOBS-clone 2 (BIO36), *Bactothrix amylovora* (EU3, EU4, EU8, EU9, EU11), *Chloroflexus aurantiacus*, *Curtunema variabilis* (Type 0041), *Cytophaga*, EPT5 australian 021N isolate (EU21), EPT5 australian 021N isolate, EU23 from SAN3, *Flexibacter*, *Herpetosiphon*, *Herpetosiphon aurantiacus*, *Leptothrix discophora*, *Megathrix sidereus* EU26 *Nostocoida*/021N-like, *Megathrix tenacis* (EU12, EU5, EU6, EU15, EU13, EU14), (EU1, EU2, EU10), *Nostocoida limicola* (EU24), *Nostocoida limicola*-like *Rhodobacter sphaeroides* next relative, *Thiothrix* 021N-group und EU1, EU2, EU10), *Thiothrix ramosa*, type 0411 (CF), type 0803, and *Nostocoida limicola*-like filamentous bacterium.

9. The method according to Claim 2, further comprising quantifying the filamentous bacterial cells with the hybridized oligonucleotides.

10. A method for the detection of filamentous bacteria in a sample, using an oligonucleotide according to claim 1.

11. A kit for performing the method according to claim 2, containing at least one oligonucleotide, selected from the group consisting of

(i) an oligonucleotide having one of the following nucleotide sequences

ACC AGC CCC TGA TAC CCT,  
AAG GTT CGC CCA CCG ACT,  
CCG ACA CTA CCC ACT CGT,  
TCT CAC CCT CAA GAT CGC,  
GCT GCA CCA CCA ATC TCT,  
AAG CCC CTC CCG ATT CCA,  
ACC TAC CTC CAG AGC ATT,  
CCC TCC CGA TTC CAT AAA,  
CAA ATA GGG GCA GGT TGC,  
TGG CCC ACC GGC TTC GGG,  
ACC CTC CTC TCC CGG TCT,  
ACC AGC CTC CAC TTC TCT,

TAC CTT CCG CTT TAG GTC,  
TCG GSC GCT CCG TGA GCG,  
CCG TGA GCG CAA GGC CTT,  
ACG TTC CTC TGC GAG CCT,  
GGC ACG GAA CGA CGC GAA,  
CTC TCC TCA CCT CTA GTC,  
CCT CTC CTC GCC TCA A,  
TCA CGG ACT TCA GGC GTT,  
CTC AGT AGA TTC CCA CGT,  
GCG GTT AGC CTA GCT ACT,  
TGG TAA CCG GCC TCC TTG,  
TAA AGC GAG ACT GAC GGC,  
TGC CGC ACT CCA GCT ATA,  
GCC GCA CTC CAG CTA TAC,  
CTC TCC CGG ACT CGA GCC,  
TCT CGA CCT CAA GAA CAG,  
ACT TCC CTC TCC CAA ATT,  
GCG ACT TGC GCC TTT CCC,  
GCT GCA CCA CCG ACC CCT,  
TGC CGC ACT CCA GCG ATG,  
ACT TCC CTC TCC CAC ATT,  
CCT TCC GAT CTC TAT GCA,  
CCT TCC GAT CTC TAC GCA,  
TGT GTT CGA GTT CCT TGC,  
GCA CCA CCG ACC CCT TAG,  
CTC AGG GAT TCC TGC CAT,  
TCG CCT CTC TCA TCC TC,  
TCC GGT CTC CAG CCA CA,  
AAG TCC CCC GAC ATC CAG,  
ACC CGA CCG TGG ACG GCT;

(ii) an oligonucleotide being at least 80% identical to one of the oligonucleotides from (i), and rendering possible specific hybridization with nucleic acid sequences of filamentous bacterial cells;

(iii) an oligonucleotide differing from one of the oligonucleotides from (i) by a deletion and/or addition and rendering possible specific hybridization with nucleic acid sequences of filamentous bacterial cells; and

(iv) an oligonucleotide hybridizing with one of the oligonucleotides from (i), (ii) or (iii) under stringent conditions.

12. The kit according to claim 11, further containing a washing solution.

13. The kit according to claim 12, further comprising one or more fixation solutions.

14. The kit according to claim 12, further comprising a cell breaking solution or enzyme solution.

15. The kit according to claim 11, containing the at least one oligonucleotide in a hybridization solution.

16. The kit according to claim 15, further containing a washing solution.

17. The kit according to claim 16, further comprising one or more fixation solutions.

18. The kit according to claim 16, further comprising a cell breaking solution or enzyme solution.